

A study to determine complications arising from stoma closure

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ABSTRACT

INTRODUCTION: Stomas are routinely used in surgical practice for a wide range of conditions. The actual benefit of stoma will depend on the successful reversal of the stoma. Closure of stoma is associated with significant morbidity and mortality. This study examines the morbidity and mortality associated with closure of an ileostomy and colostomy.

AIM OF STUDY: To study the complications arising from stoma closure.

MATERIALS AND METHOD: Thirty cases of stoma closure surgery were studied prospectively. Records of initial indication of stoma formation were studied. Distal loop cologram and colonoscopy was performed before closure. Complication observed in reversal of stoma were documented. The complications were divided into intraoperative complications, early post operative complications and late post operative complications. Possible factors leading to complications were tabulated and statistically analysed by calculating chi square and p value.

RESULTS: The complication rate was 40%. The complications observed in our study were Surgical site infection(33.3%), Enterocutaneous Fistula(3.3%) and Incisional Hernia(3.3%).

CONCLUSION: The study concludes that in stoma closure surgery the most common complication is surgical site infection. Complications occurred independent of age, sex, type of stoma, immune status and initial indication of surgery.

Date of Submission: 01-04-2023

Date of Acceptance: 11-04-2023

I. INTRODUCTION

Diversion stoma (ileostomy and colostomy) is used to reduce the risk of sepsis after very low rectal anastomosis, distal colonic anastomosis and perforations. The actual benefit from a defunctioning stoma will depend on the successful reversal of the stoma being associated with minimal risk. Closure of stoma is regarded as a challenging procedure because it is associated with significant morbidity and mortality. This study examines the morbidity and mortality associated with closure of an ileostomy and colostomy.

Although many procedures involving the distal colon and rectum can be performed as a one-stage operation, there are instances when a defunctioning stoma is recommended. These would include coloanal and ileoanal reconstruction, and colorectal anastomoses < 7 cm from the anal verge. Loop stomas may also be performed to defunction distal colorectal pathology. Diversion stomas have the advantage that it allows healing of distal anastomosis without complications and closure may be performed without recourse to full laparotomy. The complications related to the stoma must be less than those of a leakage. Minor morbidity of having a stoma are difficult to quantify, but closure has a measurable morbidity. Complication rates for closure of stomas in leading centres range from 5% to 61%¹.

This study was undertaken to assess the complication rate and postoperative course in patients undergoing closure of a stoma in our hospital.

AIM OF THE STUDY:

The aim is to determine complications in reversal of a diversion stoma.

Duration of Study

2 years i.e. 2020-2022

II. RESEARCH METHODOLOGY & MATERIAL

The research methodology involved a systematic study of various complications observed in prospective cases of stoma closure surgeries conducted in department of General Surgery in MMIMSR, Mullana. 30 cases were studied.

The method adopted was a careful examination of existing records and documentation of any complication observed in reversal of stoma patients.

The complications were divided into three categories;

- Intraoperative complication,
- Early post operative complications and,
- Late post operative complication.

Since the aim of the study was to enlist the complications of stoma reversal and their observed frequency. Possible factors leading to complications were tabulated and statistically analysed by calculating chi square and p value. The effort was also made to understand the factors leading to these complications. The inclusion criteria were all patients undergoing surgeries to create stoma.

The exclusion criteria were all patients undergoing permanent colostomy (following APR) and patients undergoing permanent ileostomy (following Proctocolectomy)

A longterm follow-up allowed to recognize late complications such as Incisional Hernia. Some patients were lost to follow up due to COVID Protocols They were followed up telephonically about the recovery and any complications. Patients consent for willingness to participate in the study was taken from the patients.

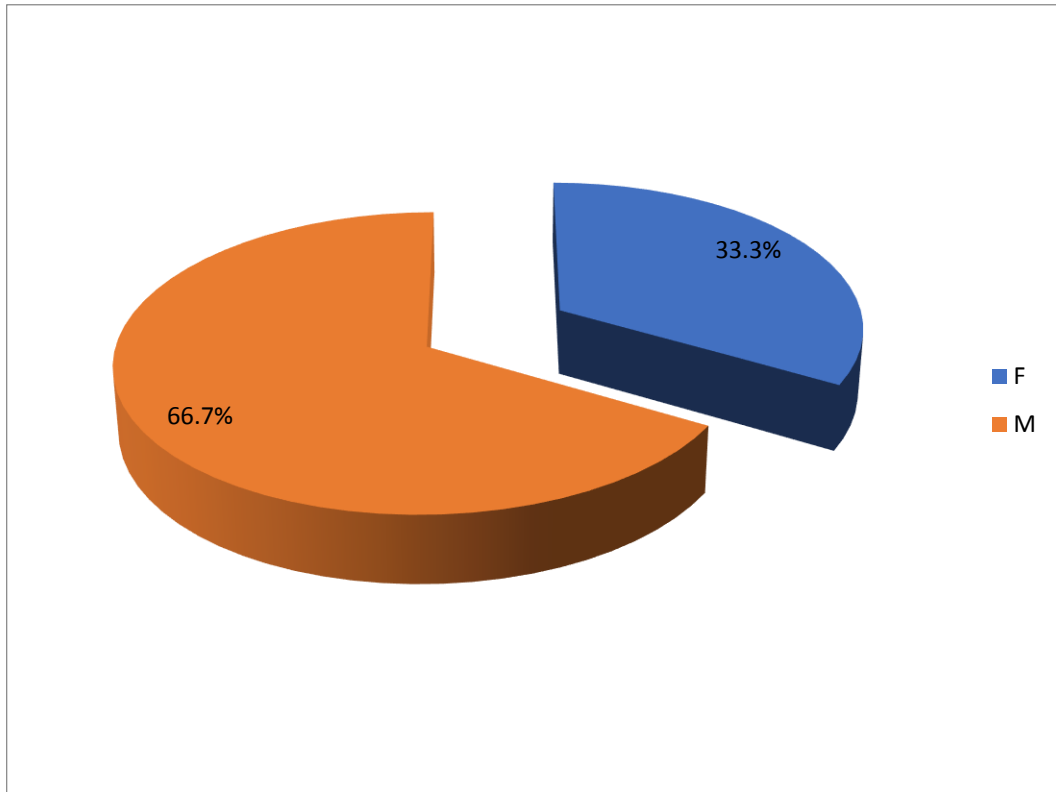
A note was made of co morbid conditions like Diabetes and HIV which have a greater risk of developing infections thereby increasing risk of complications. Association of other complications with these conditions was duly noted.

III. RESULTS AND OBSERVATIONS

A total of 30 patients with history of stoma formation were incorporated in this study. As depicted in the table-6 and graph 1, the study included 20 males, which accounts for 66.7% of the cases and 10 females, which accounts for 33.3% of the cases.

	SEX	No. of cases	Percentage	
	F	10	33.3%	
	M	20	66.7%	
	Total	30	100.0%	

Table 6: DISTRIBUTION OF PATIENTS ACCORDING TO SEX

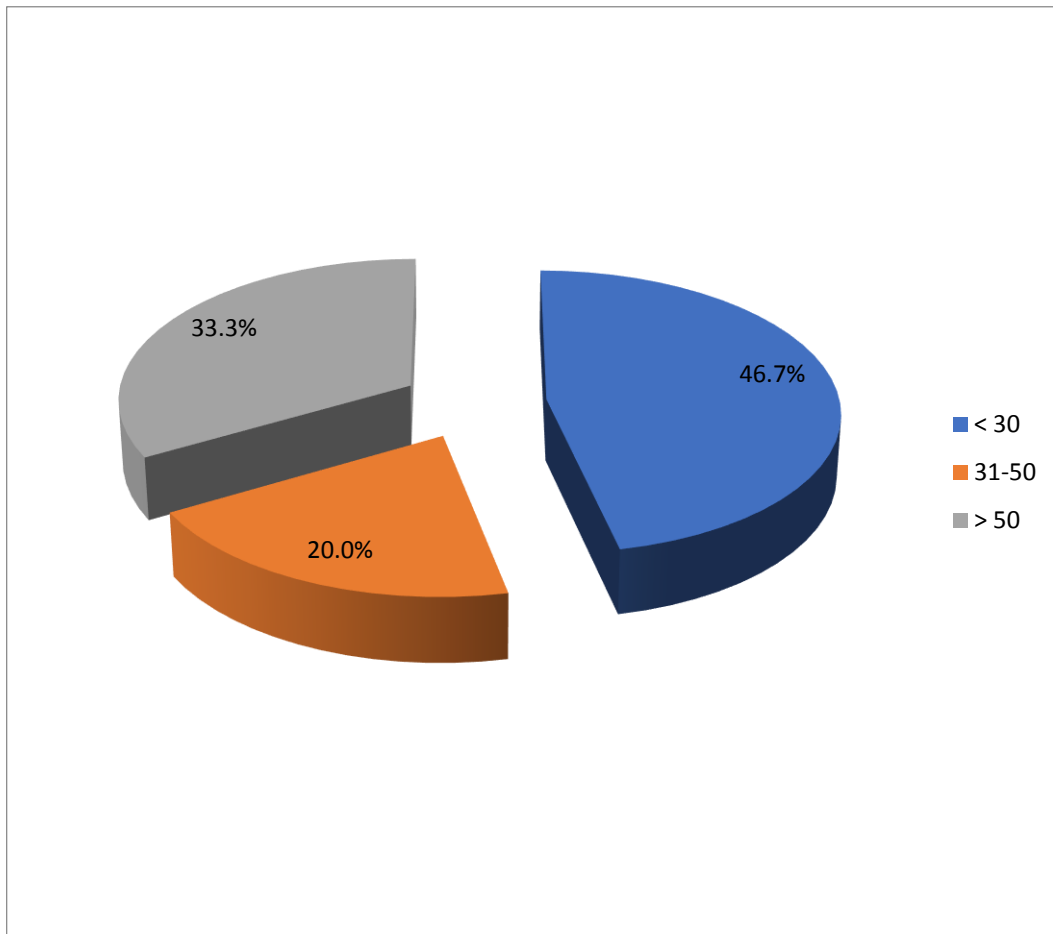


GRAPH 1 DISTRIBUTION OF PATIENTS ACCORDING TO SEX

TABLE-7: AGEWISE DISTRIBUTION OF PATIENTS

AGE GROUP	No. of cases	Percentage
< 30	14	46.7%
31-50	6	20.0%
> 50	10	33.3%
Total	30	100.0%

As shown in table 7 and graph 2, the age wise distribution of patients indicate that patient undergoing stoma surgeries and their consecutive closure are young adults aged less than 30 years comprising of 46.7% of the cases, patients aged more than 50 were 33.3% of cases and 20% of the cases were aged between 31-50 years. Mean age of patients in our study was 37.9 years.

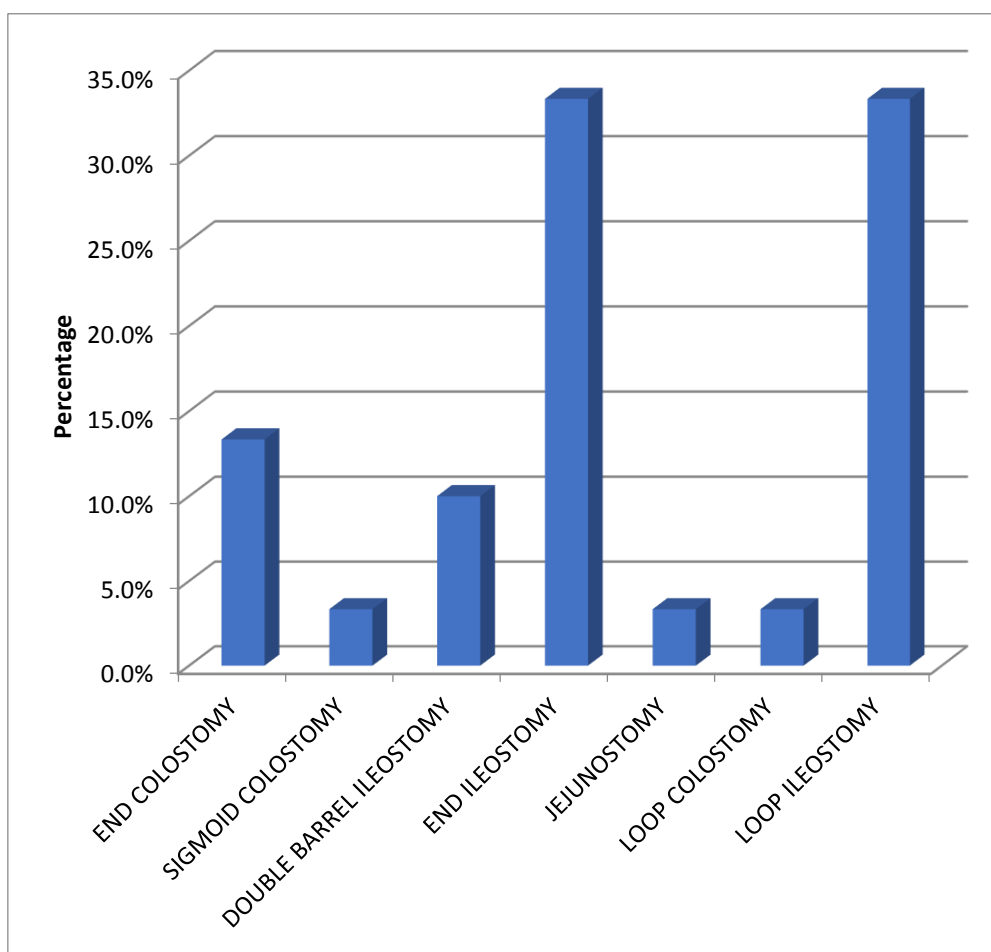


GRAPH 2 AGEWISE DISTRIBUTION OF PATIENTS

TABLE 8 DISTRIBUTION OF PATIENTS ACCORDING TO STOMA TYPE

TYPE OF STOMA	No. of cases	Percentage
END COLOSTOMY	4	13.3%
SIGMOID COLOSTOMY	1	3.3%
DOUBLE BARREL ILEOSTOMY	3	10.0%
END ILEOSTOMY	10	33.3%
JEJUNOSTOMY	1	3.3%
LOOP COLOSTOMY	1	3.3%
LOOP ILEOSTOMY	10	33.3%
Total	30	100.0%

As shown in table 8 and graph 3, Ileostomy was performed in majority of patients. 33.3% cases of loop ileostomy and 33.3% cases of end ileostomy were performed. End colostomy was done in 13.33% cases. Double barrel ileostomy was done in 10% of the cases. There was a single case each of jejunostomy (3.3%), loop colostomy (3.3%) and sigmoid colostomy (3.3%).



GRAPH 3 DISTRIBUTION OF PATIENTS ACCORDING TO STOMA TYPE

TABLE 9 DISTRIBUTION OF PATIENTS BASED ON COMORBIDITIES

	CO MORBIDITIES	No. of cases	Percentage
	HIV	1	3.3%
	DIABETES MELLITUS	0	
	HYPERTENSION	0	
	NONE	29	96.7%
	Total	30	100.0%

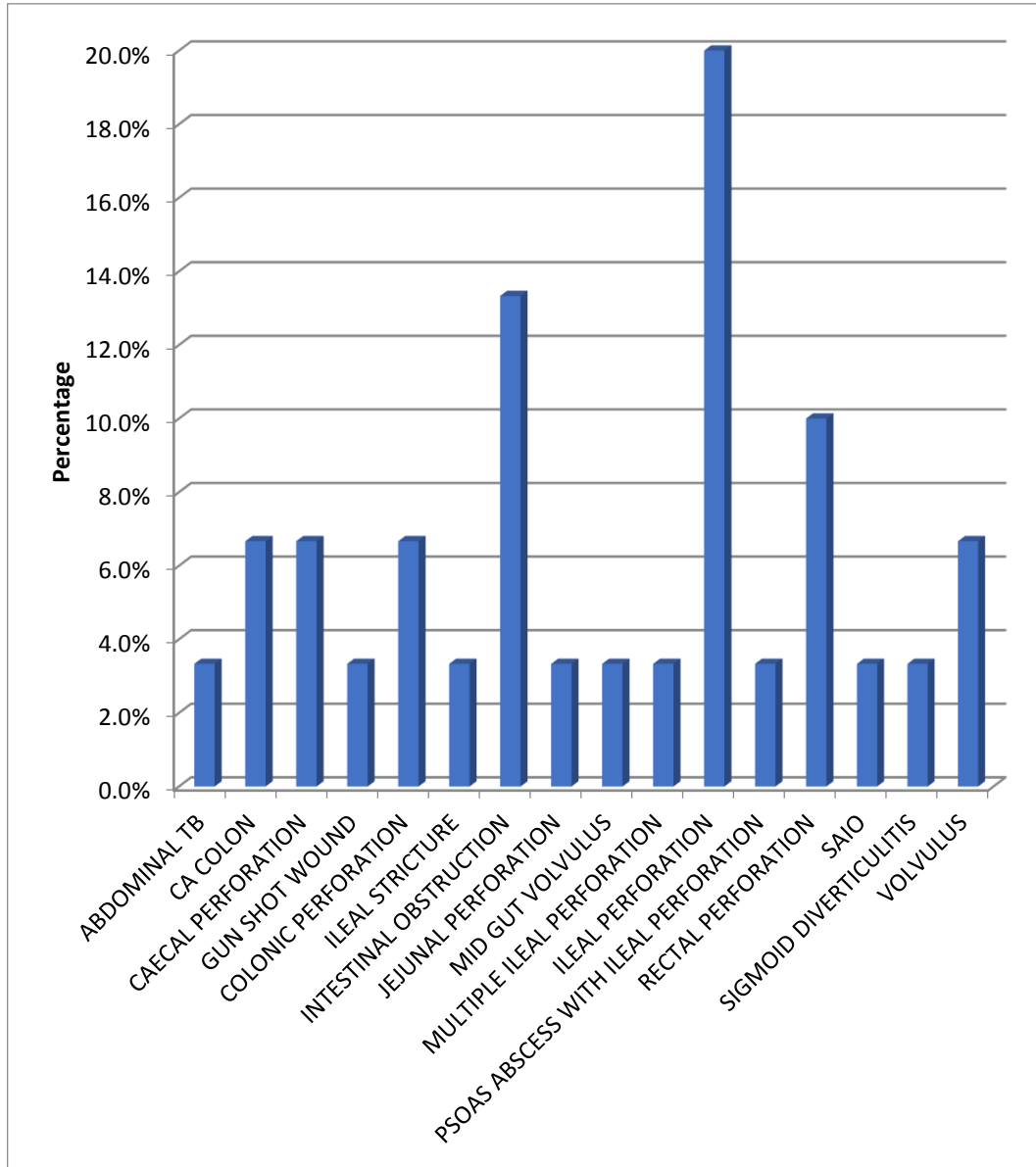
As shown in table 9, One patient who underwent stoma closure was HIV positive. Patients were also screened for any pre-existing comorbidities However, none of the other patients had any co morbidities.

TABLE 10 NO. OF CASES ACCORDING TO VARIOUS INDICATION FOR STOMA FORMATION

INDICATION FOR SURGERY	No. of cases	Percentage
ABDOMINAL TB	1	3.3%
CA COLON	2	6.7%
CAECAL PERFORATION	2	6.7%
GUN SHOT WOUND	1	3.3%
COLONIC PERFORATION	2	6.7%
ILEAL STRICTURE	1	3.3%
INTESTINAL OBSTRUCTION	4	13.3%
JEJUNAL PERFORATION	1	3.3%
MID GUT VOLVULUS	1	3.3%
MULTIPLE ILEAL PERFORATION	1	3.3%
ILEAL PERFORATION	6	20.0%
PSOAS ABSCESS WITH ILEAL PERFORATION	1	3.3%
RECTAL PERFORATION	3	10.0%
SAIO	1	3.3%
SIGMOID DIVERTICULITIS	1	3.3%
VOLVULUS	2	6.7%
Total	30	100.0%

As shown in table 10 and graph 4, the highest no of cases being of intestinal perforation accounting for 66.6% of cases where in all perforations are clubbed together.

Most common indication for stoma formation was ileal perforation followed by intestinal obstruction. The indications of stoma formation were far and wide ranging from abdominal TB to gunshot wound to rectal perforation. Rest were less common indications.

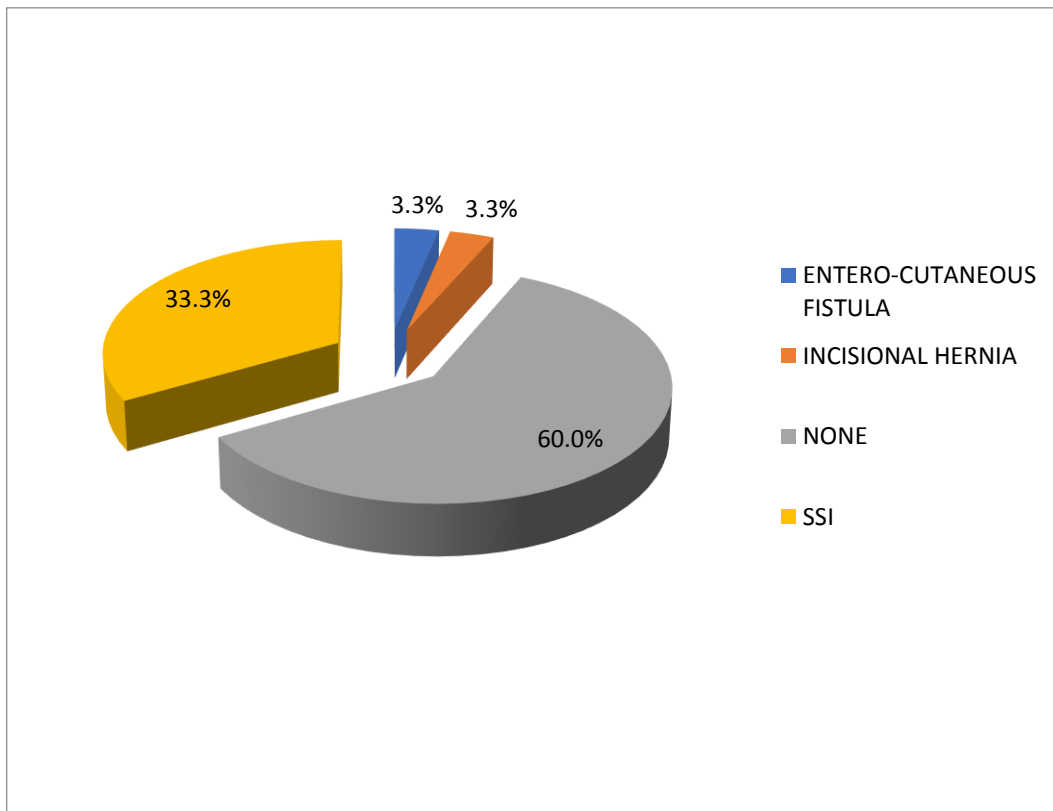


Graph 4 INDICATIONS OF STOMA FORMATION

TABLE 11: COMPLICATIONS

	COMPLICATIONS	NO OF PATIENTS	PERCENTAGE
INTRAOPERATIVE	1. Hematoma	0	0
	2. Injury to adjacent bowel or mesentry	0	0
EARLY POST OPERATIVE	3. Obstruction	0	0
	4. Surgical Site Infections	10	33.30%
	5. Anastomotic Leak	0	0
	6. Enterocutaneous fistula	1	3.33%
LATE POSTOPERATIVE	7. Incisional Hernia	1	3.33%

As shown in table 11 and graph 5, Surgical Site Infection is the most common complication comprising for 33.3% of all cases. Less frequently seen complications were enterocutaneous fistula (3.3%) and Incisional hernia (3.3%).

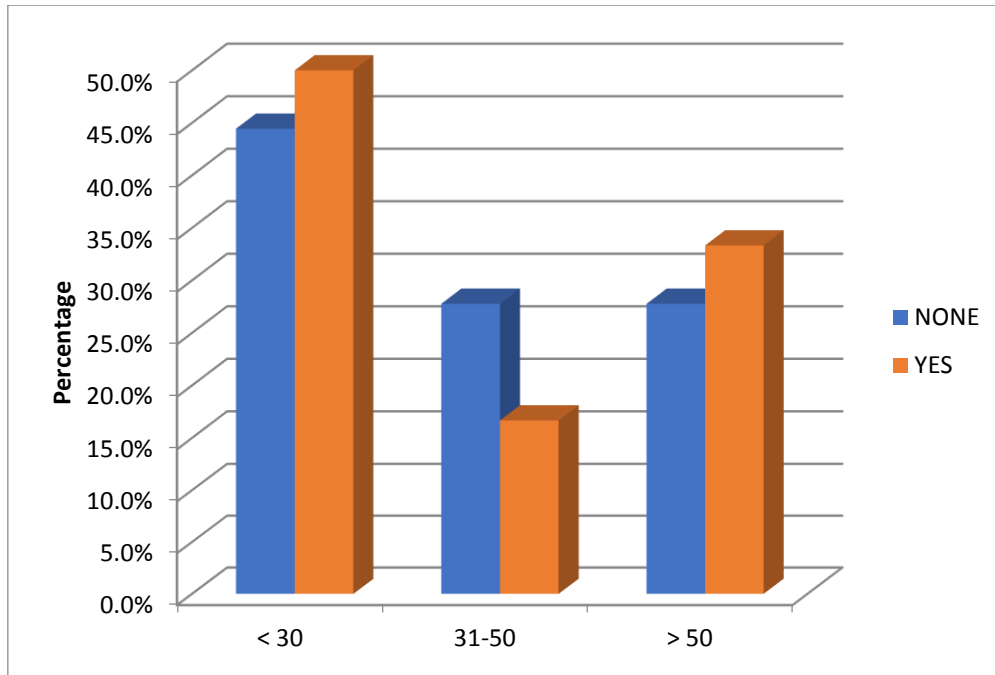


GRAPH 5 COMPLICATIONS

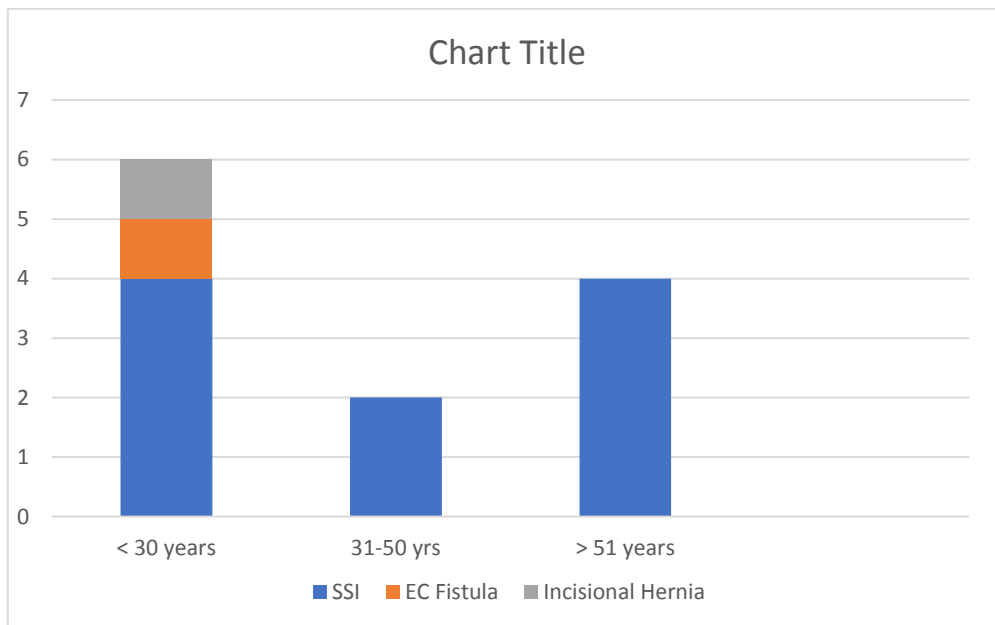
TABLE 12 COMPLICATIONS ACCORDING TO AGE GROUP OF PATIENTS

AGE GROUP	COMPLICATION	NONE		YES		Total	Chi-square value	p-value
		NONE	PERCENTAGE	YES	PERCENTAGE			
	<30	8	44.4%	6	50.0%	14	1.825	0.401
	31-50	5	27.8%	2	16.7%	6		
	>50	5	27.8%	4	33.3%	10		
Total		18	100.0%	12	100.0%	30		

As shown in table 12 and graph 6-7, complication rate was more in younger age group. About 42 percent (6/14) of the patients less than 30 years developed complications. Two patients out of six developed complications in age group 31-50 years. Forty percent (4/10) developed complications in age group > 51 years. SSI was the commonest complication in all age groups.



GRAPH 6 COMPLICATIONS ACCORDING TO AGE GROUP OF PATIENTS

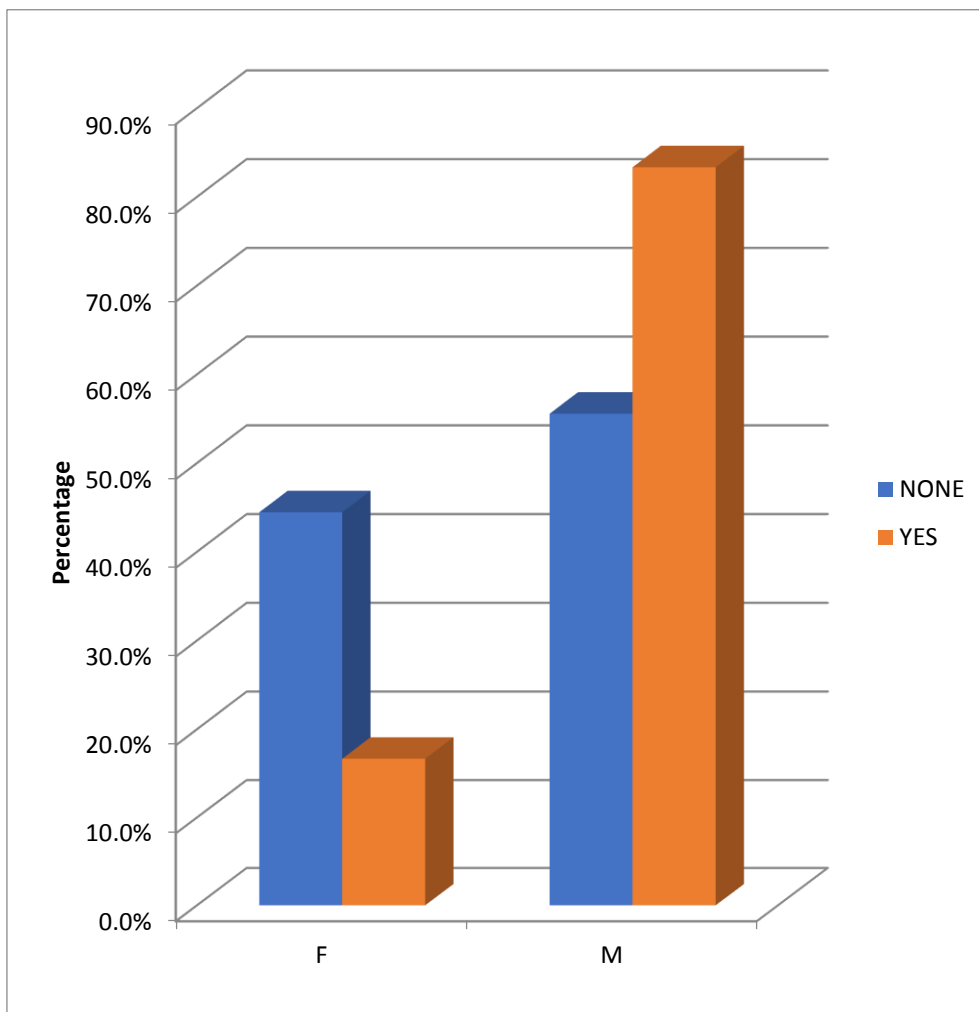


GRAPH 7 AGE GROUP AND COMPLICATIONS

TABLE 13: COMPLICATIONS ACCORDING TO SEX OF THE PATIENT

	COMPLICATION	NONE		YES		Total	Chi-square value	p-value
		No. of cases	%age	No. of cases	%age			
SEX	F	8	44.4%	2	16.7%	10	2.500	0.235
	M	10	55.6%	10	83.3%	20		
Total		18	100.0%	12	100.0%	30		

As shown in table 13 and graph 8, two out of 10 females developed complications whereas among males 50% of them developed a complication i.e, 10 out of the 20. Nine of the male patients developed SSI.



GRAPH 8 COMPLICATIONS ACCORDING TO SEX OF THE PATIENT

TABLE 14: COMPLICATIONS ACCORDING TO VARIOUS TYPES OF STOMA

TYPE OF STOMA	COMPLICATION	NONE		YES		Total	Chi-square value	p-value
		NONE	NONE	YES	YES			
TYPE OF STOMA	END COLOSTOMY	3	16.7%	1	8.3%	4	8.194	0.316
	SIGMOID COLOSTOMY	0	0.0%	1	8.3%	1		
	DOUBLE BARREL ILEOSTOMY	3	16.7%	0	0.0%	3		
	END ILEOSTOMY	7	38.9%	3	25.0%	10		
	JEJUNOSTOMY	0	0.0%	1	8.3%	1		
	LOOP COLOSTOMY	1	5.6%	0	0.0%	1		
	LOOP ILEOSTOMY	4	22.2%	6	50.0%	10		
Total		18	100.0%	12	100.0%	30		

As shown in table 14, complications were seen in 6 loop ileostomies, 3 end ileostomies, 1 jejunostomy, 1 end colostomy and 1 sigmoid colostomy.

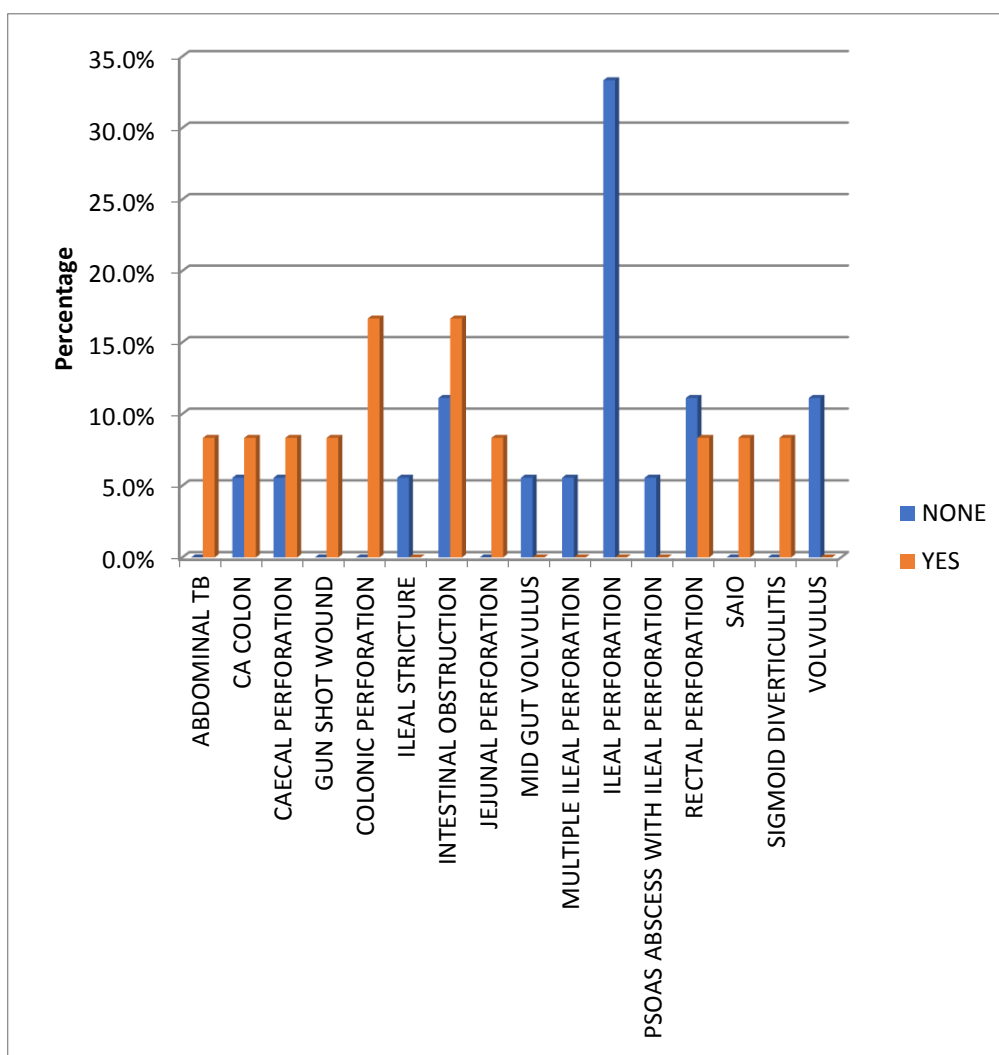
TABLE 15 COMPLICATION ACCORDING TO STOMA TYPE AND THEIR PERCENTAGE

TYPE OF STOMA	TOTAL NUMBER	DEVELOPED COMPLICATION	PERCENTAGE
END COLOSTOMY	4	1	25%
SIGMOID COLOSTOMY	1	1	100%
DOUBLE BARREL ILEOSTOMY	3	0	0%
END ILEOSTOMY	10	3	30%
JEJUNOSTOMY	1	1	100%
LOOP COLOSTOMY	1	0	0%
LOOP ILEOSTOMY	10	6	60%

As shown in table 15, complications were seen in 60 % of the loop ileostomy, 30% in end ileostomy and 25% in end colostomy. Solitary case of jejunostomy and sigmoid colostomy developed complication. Double barrel ileostomy and loop colostomy did not develop any complications.

TABLE 16 COMPLICATIONS SEEN IN PATIENTS ACCORDING TO INITIAL INDICATION OF SUGERY

INDICATION FOR SURGERY	COMPLICATION	NONE		YES		Total	Chi-square value	p-value
		NONE	NONE	YES	YES			
INDICATION FOR SURGERY	ABDOMINAL TB	0	0.0%	1	8.3%	1	18.889	0.219
	CA COLON	1	5.6%	1	8.3%	2		
	CAECA PERFORATION	1	5.6%	1	8.3%	2		
	GUN SHOT WOUND	0	0.0%	1	8.3%	1		
	COLONIC PERFORATION	0	0.0%	2	16.7%	2		
	ILEAL STRICTURE	1	5.6%	0	0.0%	1		
	INTESTINAL OBSTRUCTION	2	11.1%	2	16.7%	4		
	JEJUNAL PERFORATION	0	0.0%	1	8.3%	1		
	MID GUT VOLVULUS	1	5.6%	0	0.0%	1		
	MULTIPLE ILEAL PERFORATION	1	5.6%	0	0.0%	1		
	ILEAL PERFORATION	6	33.3%	0	0.0%	6		
	PSOAS ABSCESS WITH ILEAL PERFORATION	1	5.6%	0	0.0%	1		
	RECTAL PERFORATION	2	11.1%	1	8.3%	3		
	SAIO	0	0.0%	1	8.3%	1		
	SIGMOID DIVERTICULITIS	0	0.0%	1	8.3%	1		
VOLVULUS	2	11.1%	0	0.0%	2			
Total		18	100.0%	12	100.0%	30		



GRAPH 9 COMPLICATIONS SEEN IN PATIENTS ACCORDING TO INITIAL INDICATION OF SUGERY

TABLE 17 INDICATION OF SURGERY WITH TYPE OF STOMA THAT DEVELOPED COMPLICATIONS

INDICATION FOR SURGERY	No. OF PATIENTS WITHOUT COMPLICATIONS	No. OF PATIENTS DEVELOPED COMPLICATIONS	TYPE OF STOMA MADE
ABDOMINAL TB	0	1	ILEOSTOMY
CA COLON	1	1	ILEOSTOMY
CAECAL PERFORATION	1	1	ILEOSTOMY
GUN SHOT WOUND	0	1	ILEOSTOMY
COLONIC PERFORATION	0	2	ILEOSTOMY
ILEAL STRICTURE	1	0	
INTESTINAL OBSTRUCTION	2	2	ILEOSTOMY
JEJUNAL PERFORATION	1	1	JEJUNOSTOMY
MID GUT VOLVULUS	0	0	
MULTIPLE ILEAL PERFORATION	1	0	
ILEAL PERFORATION	6	0	
PSOAS ABSCESS WITH ILEAL PERFORATION	1	0	
RECTAL PERFORATION	2	1	COLOSTOMY
SAIO	0	1	ILEOSTOMY
SIGMOID DIVERTICULITIS	0	1	COLOSTOMY
VOLVULUS	2	0	
TOTAL	18	12	

As shown in table 16-17 and graph 9, diversion stoma was made in 6 cases of ileal perforation, none of them developed complications. Stoma was made in four cases of intestinal obstruction, two of them developed complications. One out of 3 cases of rectal perforations developed complications. Two cases of colonic perforation were operated both of them developed complication. In two cases each of Ca colon and caecal perforation diversion stoma was performed, 50% of them (one each) developed complications. Two cases of sigmoid volvulus were operated none of them developed complication. Solitary case of abdominal tuberculosis, gun shot wound, jejunal perforation, SAIO, sigmoid diverticulitis developed complications. Solitary case of ileal stricture, multiple ileal perforation, psoas abscess with ileal perforation and mid gut volvulus did not develop any complication.

IV. DISCUSSION

The present study was aimed to determine complications arising out of stoma closure.

In our study, there were 20 males (66.6%) and 10 females (33.3%) There were 47 (35.6%) females and 85 (64.4%) males in the study by Eligijus Poskus⁷ et. al. In another study Alexandre Z.⁸ et al. A total of 39 patients were included, 53.8% male and 46.2% female. In a study done by Asadullah Khan et al, the total number of study participants was 241, There were 123 males (51%), whereas 118 (49%) patients were females. In a study by Herwig Pokorny⁶ et al included 533 patients in the study; 223 (42%) were female and 310 (58%) were males. In all of the studies there was male preponderance. Men were affected 1.5 to 2 times more as common than women. This was consistent in our study too because, perforations were more common among males.

In our study, maximum patients were from the age group <30 years with the mean age of 37.9 years. The maximum patients in the quoted study Eligijus Poskus⁷ et. al were from the age group 50-70 years. In another study by Alexandre Z.⁸ et al. mean age was 52.4 years. 241 among which 113 (47%) were in age 18-40 years, whereas 128 (53%) patients were in age 41-60 years. The mean age was 40±10.05. In a study by Herwig Pokorny⁶ et al the median age of all patients was 56 years (interquartile range, 43-68 years). Patients in our study were much younger as compared to other studies. This difference is due to the fact that the most common indication for stoma formation was small bowel perforation, a disease of younger age group. Whereas in other studies diversion was made in large bowel pathologies, mainly colorectal malignancy.

In our study, commonest stoma which was made was an ileostomy followed by colostomy and jejunostomy. There were more cases of ileostomy due the fact that ileal pathologies topped the list of indications of stoma formation. Colonic pathologies were more common in other studies in which ileostomy was preferred. We treated more of small bowel benign surgical pathologies. Stoma being made at the site of small bowel perforation. So, it was the preferred stoma in our study as well. Furthermore, ileostomies though, less physiological carries less complication rate and good healing on subsequent closure.

In our study, we had just one patient with HIV and no patients of diabetes mellitus, hypertension and anaemia. In the study by Eligijus Poskus⁷ et al 9 patients (6.82%) had diabetes mellitus. Three of them had postoperative complications. Two (1.52%) showed anaemia, of whom neither had complications. The patient with HIV did not develop any complication in our study, because of low viral load.

In our study, the most common diagnosis was Intestinal perforation for which diversion stoma was made. We had only 6.6% patients of malignancy. In a study by Eligijus Poskus⁷ et al most common primary diagnosis was colorectal cancer (97 patients (73.5%). A total of 101 patients had their ileostomies created as part of surgery for malignancy and 31 for benign pathology of which the majority was colonic fistula. In a study done by Asadullah Khan et al, the total number of study participants was 241. Among them 106(44%) had enteric perforation, 87 (36%) had blunt trauma, and 48 (20%) had abdominal tuberculosis. In our study the list of indication for stoma formation is consistent with other studies. Benign pathologies were commonly encountered in our study. Whereas, stoma for malignant disease was formed more commonly in other studies. This can be attributed to younger group of patients and our study being done in a developing country with more burden of infectious diseases.

In our study, 40% (12/30) patients developed complication. Ten (33.3%) of the patients developed SSI, one patient (3.3%) developed enterocutaneous fistula and one patient (3.3%) developed incisional hernia. In the retrospective study by Herwig Pokorny et al. Surgery-related complications were observed in 107 patients (20%). Wound infection and anastomotic leakage were the most frequent complications. Leaks occurred in 29 patients (5%), of whom (3%) required relaparotomy. Twelve patients (2%) responded to conservative treatment. Ileus occurred in 21 patients (4%), of whom 7 (1%) required a laparotomy. Postoperative bleeding occurred in 11 patients (2%), of whom 7 (1%) required a laparotomy. Wound infections (n = 46 [9%]) were found mainly after colostomy closure In another study by Alexander et al. Complications were encountered in eight patients (20.5%). The most common adverse event was anastomotic leakage. In this matter Eligijus Poskus⁷ et. al reported that Complications occurred in 24 patients (18.2%), with 20 of them having surgical complications: bowel obstruction (6.8%), wound infection (3.0%), peritonitis due to anastomotic leak (2.3%), intra-abdominal abscess (1.5%), anastomotic leak with enterocutaneous fistula (0.76%), and bleeding (0.76%). Four patients had

non-surgical complications: postoperative diarrhoea (1.5%), urinary retention (0.76%), and deep vein thrombosis (0.76%).

In a study done by Asadullah Khan et al, the frequency of early post-op complications of ileostomy reversal was the following: (8%) had surgical site infection, (6%) patients had wound dehiscence, (5%) patients had small bowel obstruction, and three (1%) patients had anastomotic leak. Since closure of a stoma is a clean contaminated surgery, the rate of SSI was higher in our study which is one of the most common complication in other studies too. The complications like obstruction, peritonitis with anastomotic leak, anastomotic stricture, hematoma, Injury to adjacent bowel or mesentery were not seen in our study. In all the above quoted studies including ours SSI was the most common complication post stoma closure surgery. Fortunately, our patients did not develop anastomotic leak which was the second most commonly encountered complication.

In our study, twelve patients developed complications. Six were aged less than 30 years (50%), two between 31-50 years (16.6%) and four more than 50 years (33.3%). Complications were more common in younger age group as compared to other studies. However, this was not statistically significant ($p>0.05$). This difference was attributed to fact that our study had more patients in younger age group with benign pathologies.

In our study, 2 (16.7%) out of 12 patients with complications were females and 10 (83.3%) were males. Though more males developed complications but it was not statistically significant ($p>0.05$). The result was attributed to the fact that there was male preponderance in our study. This was consistent with other studies.

In our study, twenty three out of 30 stomas were ileostomies, six were colostomies and one jejunostomy. Complications were seen in nine (39%) patients with Ileostomy, two (33.3%) patients with colostomy and one (100%) patient with jejunostomy. Other studies did not mention any correlation between type of stoma and complication rate. However, these were statistically insignificant ($p>0.05$).

In our study, stoma made for small bowel pathologies were more common. Twenty-one patients had small bowel pathologies most common among them being ileal perforation and nine had large bowel pathologies most common among them being rectal perforation. It was very interesting to observe that when listed according to initial indication of stoma formation vs the chances of getting a complication in its subsequent closure there were no cases of SSI in ileal perforation. Diversion stoma was made in 6 cases of ileal perforation none of them developed complications. Stoma was made in four cases of intestinal obstruction, two of them developed complications. One out of 3 cases of rectal perforations developed complications. Two cases of colonic perforation were operated, both of them developed complication. In two cases each of Ca colon and caecal perforation diversion stoma was performed, 50% of them (one each) developed complications. Two cases of sigmoid volvulus were operated, none of them developed complication. Solitary case of abdominal tuberculosis, gunshot wound, jejunal perforation, SAIO and sigmoid diverticulitis developed complications. Solitary case of ileal stricture, multiple ileal perforation, psoas abscess with ileal perforation and mid gut volvulus did not develop any complication.

Role of initial indication of stoma formation and development of complications on its subsequent closure is statistically insignificant ($p>0.05$). The initial indication of surgery had no role in development of complications. Other studies did not mention any correlation between initial indication of stoma and complication on subsequent closure.

V. CONCLUSION

Formation of stoma and its subsequent closure is one the most commonly performed surgeries in India. There is long list of indications that need stoma formation like intestinal perforations, intestinal obstruction due to various underlying aetiologies like typhoid, carcinoma, Crohn's etc.

Pathologies requiring a stoma were more common in young males. Irrespective of the site of pathology, Ileostomy was the preferred stoma. Ileal perforation with patient in shock was the most common indication for stoma formation. Forty percent of the patients developed complications. SSIs was the most common complication seen. The results of the study fortunately show a zero incidence of any major complications like anastomotic leak and obstruction. Age, sex, type of stoma, initial indication of stoma and immune status did not predispose to complications. The differences we have enlisted were statistically insignificant.

The study concludes that Complications were seen independent of age, sex, type of stoma, indication for stoma formation and immune status.

Our future endeavour would be to do a comparative analysis on complications rates after stapled closure of stoma since all our cases were of hand sewn. Fresh 30 cases will be closed with staplers and results analysed.

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XXXXXXX. "A study to determine complications arising from stoma closure." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 22(4), 2023, pp. 12-25.